NON-PUBLIC?: N
ACCESSION #: 9107080123
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Maine Yankee Atomic Power Company PAGE: 1 OF 4

DOCKET NUMBER: 05000309

TITLE: Plant Trip Due To Low Steam Generator Water Level
EVENT DATE: 05/30/91 LER #: 91-006-00 REPORT DATE: 07/01/91

OTHER FACILITIES INVOLVED: Maine Yankee DOCKET NO: 05000309

OPERATING MODE: 7 POWER LEVEL: 12

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: James M. Taylor, Senior Nuclear TELEPHONE: (207) 882-6321

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: PS MANUFACTURER: B070
X SJ RLY G080
REPORTABLE NPRDS: YES
YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1754 on May 30, 1991, with the reactor at 12% power, an automatic reactor trip occurred due to actuation of the Reactor Protective system. Level in steam generator number one dropped below the low steam generator water level trip setpoint when main feedwater pump (P-2A) tripped on low suction header pressure. The feedwater pump tripped when the main feedwater regulating valves had been opened an excessive amount allowing a large inflow of feedwater.

During this event, standby main feedwater pump P2B did not run and standby condensate pump P27C did not automatically start when they should have. Subsequent testing and evaluation found pressure switch PS 1305B, which provides an auto trip signal to P2B, to be defective. A replacement pressure switch was installed and tested.

Pressure sensing switches associated with main feedwater pump auto start and auto trip functions were tested and calibrated. Pressure sensing lines were blown down. Pressure sensing equipment and circuitry associated with P27C auto start functions were inspected and functionally checked.

An attachment providing enhanced guidance for operating the feedwater station during plant startup at low power will be added to the plant startup procedure. During the next refueling outage, February 1992, a modification to the main feedwater regulating system will include installing new main feedwater regulating valve controllers.

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END OF ABSTRACT

Plant Trip Due to Low Steam Generator Water Level

At 1754 on May 30, 1991, with the reactor at 12% power, an automatic reactor trip occurred due to actuation of the Reactor Protective System (RPS) (JC) on low level in steam generator (SG) number one. RPS channels A and B sensed the low level and completed the two out of four logic necessary for an RPS trip.

Prior to this event, the plant startup procedure had been completed to the point of phasing the main generator and main feedwater flow was being provided by motor driven main feedwater pump P2A through the main feedwater regulating valves (MFRV) with their controllers (JB) in manual. The main feedwater regulating valves bypass valves (MFRVBV) were also in operation in the automatic mode. Condensate pump P27B was running and standby condensate pump P27C was in auto.

To facilitate maintenance activities on the main generator (EL), the main turbine was tripped and the reactor held steady at 12% power for approximately ninety minutes. Tripping the turbine closed the MFRVs by removing signals from the MFRV controllers to the valves and control of MFRVBVs was transferred from the MFRVBV controllers on the main control board (MCB) to the "tripset controllers" which provide a fixed 5% flow signal to the MFRVBVs. Control of the MFRVBVs was transferred back to the MCB controllers by the control room operator (CRO). The MCB MFRVBV controllers remained in the automatic mode. During the ninety minute delay period, the manual setpoints for the MFRV controllers were inappropriately adjusted to a greater than 35% open signal.

At 1748:11 the turbine was latched, restoring the signal from the MFRV controllers to the MFRVs. The greater than 35% open manual signal set on the MFRV controllers opened the MFRVs, causing a rapid increase in feedwater flow. Increased main feedwater flow caused main feedwater pump suction header pressure to drop below the automatic main feedwater pump trip setpoint of 240 psig. P2A tripped, stopping main feedwater flow. Due to the feedwater system line-up feedwater pump suction header pressure had been below the condensate pump auto start setpoint of 420 psig for twelve hours. Thus condensate pump P27C should have been running but had failed to auto start. With no MFW pumps running, MFW pump discharge header pressure dropped to below the MFW pump auto start setpoint of 975 psig. P2As breaker closed but opened in six seconds. After several breaker cyclings a MCB annunciator for P2A overcurrent illuminated indicating its lock-out relay (86-device) had activated. Control room operators (CROs) placed the P2A control switch (CS) in pull-to-lock (PTL) and an operator went to the switchgear room to investigate and reset the 86 device. P2B attempted to auto start but its breaker opened one second after closure. After several attempted starts CROs placed the P2B CS in PTL.

At 1748:36 CROs tripped the turbine. Steam generator water levels continued to decrease.

At 1749:06 CROs attempted to manually start P2B but its breaker immediately opened after closure.

At 1752:49 CROs started emergency feedwater (EFW) (BA) pump P25C and began to introduce EFW Flow to the steam generators.

At 1753, after being notified that the P2A breaker 86 device had been reset, CROs manually started P2A. MFW discharge header pressure increased to 1377 psig (pressure had been less than 764 psig since 1748:41). Steam generator water levels, which were already below the 45% level RPS pretrip setpoint, decreased farther with the introduction of cold feedwater. RPS channels A and B sensed low steam generator water level in steam generator number one and completed the two out of four logic necessary for the RPS trip at 1754:10.

Causes of this event were operator error and equipment malfunctions. A cognitive error by a licensed CRO operating the MFRV controllers resulted in excessive MFW flow. Main feedwater pump P2B would not run. Condensate pump P27C did not auto start when required. Also a control

relay failed in the P2A breaker.

To correct equipment malfunctions the pressure switches for MFW pump suction pressure start permissive, lube oil pressure start permissive, auto start on low discharge header pressure, auto trip on low suction header pressure and auto trip on low lube oil pressure were tested and calibrated. Pressure switches for MFW pump lube oil pump start and stop and for condensate pump auto start on low feedwater suction header pressure were also tested and calibrated. Pressure sensing lines for the above pressure switches were checked for blockage and blown down with water. No blockage or abnormal sludge was found.

Pressure switch PS 1305 B manufactured by Barkesdale model number BIT-A1255, which provides an auto trip signal for P2B on low feedwater suction header pressure, was found to perform in an erratic manner. PS 1305 B exhibited step-like changes and a questionable reset function. Its abnormal performance may be the cause for P2B's failure to run. A replacement for PS 1305 B was installed and satisfactorily tested. P2Bs breaker was inspected on the test stand and found in satisfactory condition.

During inspection of the P2A breaker on the following day, its control (anti-pumping) relay (RLY) was found to have a faulty coil. This relay manufactured by General Electric (GE) part number 0137A7575 POOL is used in GE MAGNE-BLAST circuit breakers. This failed control relay allowed P2As breaker to close and immediately open five times in succession before, the breaker finally (at 1753) remained closed causing a delay in pump start of seven seconds. A replacement control relay was installed and satisfactorily tested.

Actuation of the P2A 86 device may have been caused by actuation of the overcurrent ground protection relay (50 GS). The actuation flag for 50 GS was showing when the operator went to the switchgear room to reset the 86 device. The 50 GS relay does not stay locked-in but its flag must be manually reset. Repeated rapid opening and closing of the breaker during the first thirty seconds of the event is considered the cause of a phase differential condition. 50 GS is actuated by a phase differential. Following reset of the 86 device P2A was manually started with the only difficulty being cycling of the breaker due to failure of the control relay noted above. Motor amperage was normal and no defects were found by visual inspection. On the following day the breaker was inspected on the test stand and no destructive evidence of a ground was found.

The following actions were taken to determine why P27C autostarted later than it should have. Pressure switch PS 1303, located on the P2B suction header, controls the auto start of P27C. No defects were found when PS 1303 was tested and
alibrated. Its pressure sensing lines were blown
down with water and found to be unobstructed. Relays and contacts associated with PS 1303 and auto start of P27C were inspected and found in satisfactory condition. An attempt was made to duplicate the performance of P27C during the event. MFW pump suction header pressure was decreased to below the condensate pump auto start setpoint. PS 1303 provided an auto start signal and P27C auto started as expected.

To reduce the chance of operator error while operating the feedwater regulating station during plant startup at low power conditions, the plant startup procedure will be enhanced by September 30, 1991. An attachment will be added to the procedure which provides guidance to remind operators of feedwater regulating system responses to differing configurations at low power levels during plant startup. A Human Performance Enhancement System (HPES) report is being prepared to address human performance aspects.

A modification of the feedwater regulating system scheduled for installation during the next (February 1992) refueling outage includes MFRV controllers which will not accept setpoint adjustments while the turbine is tripped. A zero voltage signal from the controller will exist and must be reset by the operator after the turbine has been latched and before any setpoint changes can be made. This modified design would not have permitted the conditions which led to this event.

Consequences of this event are bounded by the loss of feedwater transient described in the Final Safety Analysis Report (FSAR). The loss of feedwater transient is analyzed at full power beginning-of-cycle conditions since this results in the greatest energy production/energy removal capacity mismatch. This event occurred with the plant at a low (12%) power level, well within the bounds of the analyzed transient. Emergency feedwater was available throughout the event and flow was established just prior to the start of MFW pump P2A. Main feedwater flow was re-established before the reactor trip.

This event is similar to a November 4, 1984 plant trip (reference LER 84-017). In the prior event a different cognitive personnel error in operation of the MFRV controllers occurred. A CRO opened the MFRV isolation valves with the MFRV controllers in auto calling for excessive MFRV opening. Excessive feedwater flow and RPS trip on variable overpower occurred.

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ATTACHMENT 1 TO 9107080123 PAGE 1 OF 1

Maine Yankee
RELIABLE ELECTRICITY FOR MAINE SINCE 1972

EDISON DRIVE o AUGUSTA, MAINE 04330 o (207) 622-4868

July 1, 1991
MN-91-100 SEN-91-189

UNITED STATES NUCLEAR REGULATORY COMMISSION
Attention: Document Control Desk
Washington, DC 20555

Reference: (a) License No. DPR-36 (Docket No. 50-309)

Subject: Maine Yankee Licensee Event Report 91-006-00, Plant Trip Due to Low Steam Generator Water Level

Gentlemen:

Please find enclosed Maine Yankee Licensee Event Report 91-006-00. This report is submitted in accordance with the requirements of 10 CFR 50.73 (a)(2)(iv).

Please contact us should you have any questions regarding this matter.

Very truly yours,

S. E. Nichols, Manager
Nuclear Engineering & Licensing

SEN/sjj

Enclosure

c: Mr. Thomas T. Martin
Mr. Charles S. Marschall
Mr. E. H. Trottier
Mr. Patrick J. Dostie

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